Barker's[9] recent interesting case of arrhythmia with auricular involvement following focal infection may still further broaden our views as to the general point of attack of infectious agents and poisons on the cardiac mechanism.

Conclusions. 1. Six cases of postinfluenzal myocardial involvement are reported, involving particularly the auricle and conduction pathways of the heart.

2. From a survey of the literature together with clinical and electrocardiographic studies, a grouping of postinfluenzal cardiac complications is offered as follows:

(*a*) Fatal cases showing acute parenchymatous degeneration and vacuolization of the myocardium.

(*b*) Non-fatal, acute cases, showing involvement of auricle and conduction system during height of infection, with complete restoration to normal cardiac mechanism with subsidence of infection. Duration two to six weeks.

(*c*) Non-fatal chronic cases with arrhythmia and involvement of the auricle persisting and causing partial invalidism long after subsidence of acute infection. Duration twelve to seventeen months—plus.

3. Suggestion is offered that acute respiratory infections (Influenza, Streptococcus) single out early the auricle and conduction pathways of the heart.[10]

Appreciation to several members of the Hospital Staff is herewith offered, for permission to publish curves of their cases, and in particular to Miss Marguerite Collver, laboratory technician, for invaluable aid in the preparation of this material.

DETERMINATION OF THE NEED OF SURGERY IN PEPTIC ULCER, WITH REMARKS ON GASTRO-ENTEROSTOMY.[1]

By W. A. Bastedo, M.D.,

ASSISTANT PROFESSOR OF CLINICAL MEDICINE, COLUMBIA UNIVERSITY; ATTENDING PHYSICIAN, CITY HOSPITAL, NEW YORK; ASSOCIATE ATTENDING PHYSICIAN, ST. LUKE'S HOSPITAL.

A study of surgical statistics would convey the impression that in operative procedure we have a dependable cure for gastric and duodenal ulcer; and last year before this Association, Alvarez said: "My own conviction after many years of seeing these ulcer patients returning with relapses is that our medical treatments do little if any good except in rare cases." Yet in our own practice ulcer cases that have had one or more operations come for treatment almost as frequently as ulcer cases that have not been operated upon; and other gastro-enterologists tell us that this is also their experience. Such antagonistic ideas, therefore, furnish our excuse for this presentation on a somewhat hackneyed subject.

---

[9] Cardiac Arrhythmias, Arch. Int. Med., 1919, xxiii, 158.

[10] Probably the infections affect the whole heart similarly (*cf.* microscopic studies of auricle and ventricle), but due to other factors, such as thinness of the auricular wall, presence of ganglion cells or other unknown conditions, disturbances of auricle and conduction pathways first become evident.

[1] Read before the American Gastro-enterological Association, May 4, 1920.

Ulcer cases may require emergency treatment or they may not, and this fact divides them into two groups.

I. The Emergency Cases. The two striking emergencies which occur in gastric and duodenal ulcer are acute perforation and profuse hemorrhage. In acute perforation all will agree the earliest possible surgery is imperative.

In serious hemorrhage, on the other hand, it is generally the opinion that operative intervention is dangerous and mostly futile. Sir Berkeley Moynihan, in issuing a warning against hasty surgery, estimated that not more than 3 per cent. of profusely bleeding gastric and duodenal ulcers could be treated successfully by laparotomy. Lindberg, of Copenhagen, tabulated 68 cases of hematemesis so severe as to raise the question of an emergency operation. In all of the 68 surgery was decided against. Five died, and at autopsy it was found that not one of these could have been helped by surgery. On comparing these statistics with others from clinics where operation had been the choice, Lindberg was convinced that surgical measures are never indicated in cases of acute hemorrhage from the stomach or duodenum. We find that many surgeons have had the trying experience of opening a stomach in such a case and being unable to find the site of the bleeding. Lund, of Boston, said: "I have learned that it is poor practice, when the patient is depleted by hemorrhage, to open the stomach and try to grasp the artery in the bottom of an ulcer." Other surgeons speak in like manner.

Yet now and then one hears of a case in which life has undoubtedly been saved by surgery, as where perforation accompanied the hemorrhage or where the bleeding-point was readily found. We have in mind a recent case where a vein was held open by the indurated tissues and where undoubtedly death would have ensued had operation not been performed. And it is a trying experience, and one that seems inconsistent, for a physician to stand helplessly by while a patient vomits copious amounts of blood every hour or two and rapidly becomes exsanguinated under his very eyes. The dificulty lies in the fact that as these hemorrhages mostly cease spontaneously and are not fatal we prefer to wait, and then when we decide that the bleeding probably will not stop it is too late for surgery.

In any case, therefore, while applying the proper medical measures we should, when possible, prepare for transfusion. If the bleeding persists transfusion is the measure of choice. If transfusion fails to stop the bleeding it at least puts the patient in better condition for surgery, which then, in our opinion, might be resorted to. Thus very few of the cases would come to surgery, but these few, being hopeless otherwise, might include a sufficient proportion of operable cases to justify the procedure. That is to say, the great risk of operative intervention and the small chance of helping by operation are overshadowed by the almost certain supervention of the patient's death if operation is not performed. In such a case the surgeon who fails is without blame.

II. Cases not in the Emergency Class. In the treatment of an ordinary ulcer case surgeons are not now so ready to operate as formerly, and many grant that judgment is required as to the need of surgery; for operation always produces a damaged abdomen and a damaged stomach with a new anatomy and a new physiology; it is followed only too often by undesirable sequelæ; and frequently enough it leaves the patient relieved for a time, only to have him return later with a recurrence of symptoms which, because of the surgical damage, may be more difficult to treat than before. As Connell expresses it: "The immediate result is invariably most encouraging, but relapse is far from uncommon."

We cannot here discuss the merits of the various surgical procedures, nor compare one with another, but because it is the usual operation we shall dwell briefly on the subject of gastro-enterostomy, referring you for much interesting data to the papers of Dr. Frank Smithies and Drs. Wilensky and Crohn, which have been read recently before this Association.

Gastro-enterostomy. "This operation," in the words of Frank Martin, "has been for years the cure-all for almost every stomach malady that exists." Of 261 ulcer cases returning for treatment after operation, Smithies found that gastro-enterostomy had been done in all. But among the best surgeons today it would seem to be considered of value only for ulcers of the duodenum and of the pyloric and antral regions, and not, except in rare cases, for ulcers in the body of the stomach or high up on the lesser curvature. Indeed, many eminent surgeons agree with Deaver that "when the ulcer is located elsewhere than at the pyloric end posterior gastro-enterostomy does little if any good." However, Mills has directed attention to the fact that in certain hypotonic types of stomach, after a V-shaped or sleeve resection for ulcer of the lesser curvature, a gastro-enterostomy is required; we also have seen the necessity for gastro-enterostomy in just such cases and Peck has expressed the opinion that it is a wise procedure. Sir Berkeley Moynihan has said "under no circumstances is the operation to be done in the absence of demonstrable organic disease." Yet this cannot be an absolute rule for we have had good results in a few rebellious cases of marked gastric atony without ulcer.

Among the various reasons advanced in surgical writings to justify simple gastro-enterostomy those usually met with are the following: (1) That it relieves the pyloric end from muscular activity and from the irritation of food and gastric juice; (2) that it relieves the pyloric end from high peristaltic pressures; (3) that by being placed at the most dependent portion of the stomach it favors gravity drainage; (4) that it favors stomach emptying regardless of gravity drainage; (5) that by permitting the alkaline duodenal contents to flow back into the stomach it decreases gastric acidity. Let us consider these seriatim:

1. *That it Relieves the Pyloric End from Muscular Activity and from Food and Gastric Juice.* To emphasize the stress laid upon this factor, I would quote Richard Lewisohn, who wrote as late as 1918: "Even at the present day many surgeons consider gastro-enterostomy a safe procedure to keep food material away from the ulcer-bearing area." In the majority of cases the ulcer-bearing area is the antral, pyloric or duodenal region. Without giving the data in detail I might say that it has been shown repeatedly, both by laboratory experiments and by the roentgen rays (see 4 below), that after a gastro-enterostomy peristaltic waves occur in the pyloric end of the stomach the same as before the operation; that to a certain extent and sometimes in their entirety the food and gastric juice are swept past the new opening and take their normal course to the pylorus; and that vigorous churning takes place in this end of the stomach. In 262 postoperative cases Smithies found chymification after a mixed meal good or fair in 90 per cent. Therefore we may say that gastro-enterostomy does not result in relief of the pyloric end from muscular activity or from the irritation of food and gastric juice, though it probably lessens the degree of these.

2. *That it Relieves the Pyloric End from High Pressures.* It is at the antral and pyloric regions that normally intragastric pressure rises to the highest point. Moritz found the intragastric pressure at the cardiac end 6 to 8 cm. of water, and at the pyloric end 20 to 30 cm., with rhythmic rises to as high as 60 cm. Sick found the cardiac pressures 6 to 16 cm. and the pyloric pressures 25 to 42 cm., and von Pfungen, in a boy with a fistula in the midstomach, found the maximum pressure at the fistula 19 cm. and that at the pylorus 162 cm. In ulcer cases with hypermotility the pyloric pressure is probably quite high and in cases with hypermotility and pyloric obstruction, whether organic or spasmodic, the pyloric and antral pressures probably rise very high indeed. In pyloric obstruction without atony Crohn and Wilensky have shown that the hunger contractions may take on a spasmodic character, with correspondingly high intragastric pressures, a condition abolished by operation. They found that except in these obstruction cases hunger contractions were usually absent. Therefore, although it is agreed that in pyloric obstruction cases without atony gastro-enterostomy

results in lessened pressures on the ulcer area, yet in cases without obstruction this is by no means apparent. Certainly in Sick's case a midgastric fistula failed to relieve the pylorus from high pressure.

3. *That by being Placed at the Most Dependent Portion of the Stomach it Favors Gravity Drainage.*. At operation we have repeatedly seen surgeons, imbued with this idea, strive to select the lowest point of the stomach; and, as Martin remarks, they even place the patient in upright posture after operation to favor drainage. The fact is that the lower border of the stomach changes considerably during digestion, in the nearly empty stomach the pylorus becoming ordinarily the lowest or almost the lowest part. Moreover, as the stomach fills it rotates on an axis extending from the cardia to the pylorus. It can hardly be supposed then that what is the most dependent point at operation in a stomach rendered atonic by the anesthetic and in a patient lying on his back, will remain the most dependent point for any length of time during the digestive period after the stomach has regained its tone and the patient is upright.

As a matter of fact, however, in the ordinary alimentary tract food is not propelled by gravity but by differential pressures. Cannon and Blake showed in cats that after gastro-enterostomy, even though the animal was held up so that the opening was in the most dependent portion, water placed in the stomach did not run by gravity through the stoma into the jejunum but passed through only in response to the force of peristaltic waves. Therefore, in the ordinary case, gastro-enterostomy does not favor drainage by gravity. In the emptying of highly atonic stomachs in atonic abdomens with low intra-abdominal pressure, gravity may play a distinct role; yet in these cases unless there is pyloric stenosis the results of gastro-enterostomy are not highly encouraging.

4. *That it Favors Stomach Emptying Regardless of Gravity,* that is, by peristalsis. In regard to this I find a great discrepancy of opinion. In the roentgen-ray studies of Cannon and Blake on cats fed with fluid boiled starch the food passed regularly through the pylorus and not through the new stoma, with two exceptions, one where the stoma was in the vestibule close to the pylorus and the other where the stoma was large and in the anterior wall about half-way between the two ends of the stomach. Except for these two cases the pylorus was regularly the exit chosen, even though it was much narrowed by a ligature. This was in animals with no ulcer to cause hyperperistalsis and abnormality of pyloric closure. That both in man and laboratory animals the food mostly does pass the new opening to seek the natural outlet has been shown by others, *e. g.*, Tuffier, Delbet, Kelling, Guibe, Troell and Lewisohn; and Haertel, after the study of a large series of radiographs following gastro-enterostomy in man, observes that though in most cases food passes through both the pylorus and the new stoma, yet the peristaltic

wave is unchanged and continues to be directed as before toward the pylorus. Schueller, Petrén, Cole, Carroll and other radiographers have made similar observations.

On the other hand recent reports by C. H. Mayo, Carroll, Hartmann and Outland, Skinner and Clendenning point to the effectiveness of the gastro-enterostomy stoma; and Carman and Balfour, of the Mayo Clinic, emphatically state that the opaque meal regularly passes freely through the stoma even after years. Several observers have remarked, however, that while in the first few weeks after operation the food has taken its exit for the most part through the new outlet, yet later it has returned in large measure to the outlet through the pylorus. This might be explained by assuming that in the first few weeks the ulcer is still in the irritative stage and is effective in producing pyloric obstruction by pylorospasm; but that later, as the ulcer heals, it no longer excites pylorospasm, and therefore, as there is no longer obstruction, the food passes through the natural outlet. This would seem to be the desirable sequence of events. Truesdale showed that in some cases after the operation the pylorus, owing to disuse, undergoes atrophy and dilatation and remains permanently open. It is interesting to note how frequently in some of the relieved cases the roentgen-ray shows a six-hour residue. Smithies found an eight-hour food residue after a mixed meal in 16.4 per cent. of those returning for treatment. Carter notes an early emptying time when both pylorus and stoma are patent but delayed emptying when the pylorus is occluded at the operation. Wilensky and Crohn state that the emptying power of the stomach is not accelerated by gastro-enterostomy with pyloric blocking, but is actually retarded.

5. *That Whatever Good is Obtained is Due to the Diminution of Acidity* by the passage of bile and pancreatic juice into the stomach through the new stoma. It is Deaver's opinion that if a posterior gastro-enterostomy in ulcer of the pyloric region does any good at all it is by allowing bile and pancreatic juice to enter the stomach, thus producing a neutralizing effect on the acid contents. This is the opinion of many surgeons. It is true that following gastro-enterostomy the acidity tends to be reduced, for H. J. Paterson found that it falls on the average thirty points, and Smithies, in those returning for treatment after operation found a reduction in free acid and total acidity in about 80 per cent., the reduction averaging about twenty points, though in 17 per cent. there was no reduction and in 3 per cent. a rise in acidity. One month after operation Crohn and Wilensky found a slight average decrease in acidity though not a decrease in all cases.

The Effect of Bile and Pancreatic Juice on Acidity. Grey demonstrated by cholecystogastrostomy that when the total output of bile was made to pass through the stomach it did not materially affect the level of gastric acidity. He also deflected the total pancreatic juice into the stomach and likewise noted no material change in acidity. In a study of fractional curves after gastro-enterostomy Wilensky and Crohn observed that the influx of bile was frequently followed by a secondary rise in acidity and that at times the highest acidities were recorded when the bile was present in greatest abundance. These observations tally with our own experience and that of Smithies, that highly bilious stomach contents after gastro-enterostomy frequently show high acidities. H. S. Carter and Wilensky and Crohn have reported that a number of the operated cases gradually lowered their acidity until a complete achylia was developed. This could hardly have been due to a reflux of alkaline material. Therefore though acidities tend to be lower after gastro-enterostomy, they are not by any means always lower, and we do not believe that the diminished acidity is the effect of neutralization by regurgitated bile and pancreatic juice. As a matter of fact the degree of gastric acidity is unimportant in deciding the improvement after operation (Troell, Crohn).

To summarize our remarks on the desired effects of gastro-enterostomy we might say that *when there is obstruction* to the exit of food the operation permits stomach emptying and relieves the retention. But in *non-obstruction cases* it does not, at least to any great extent, relieve the ulcer-bearing region from peristaltic activity from the irritation of food and gastric juice and from high peristaltic pressures, it does not favor gravity drainage, it does not, as a rule, accelerate the emptying time, and it does not act through the neutralization of high acidity by the bile and pancreatic juice which it permits to enter the stomach. Therefore, except in cases of obstruction, due either to disease or to operative procedure, as in pyloric stenosis or pyloric removal and possibly hour-glass contraction, we are unable to discover a satisfactory reason for a good result from gastro-enterostomy. It would therefore seem a pertinent question to ask: Except in the presence of obstruction what useful function does gastro-enterostomy perform?

Gastro-enterostomy with Pyloric Blocking. On account of the numerous failures of gastro-enterostomy, and the frequency with which after gastro-enterostomy the food has passed in the normal direction through the pyloric exit even when this was partially obstructed, a number of surgeons have attempted to block the pylorus by means of a silk ligature. W. J. Mayo has concluded that such blocking gives no advantage, and this belief is concurred in by Scudder, Gonnerud and others; and as it has not been a successful procedure, it has largely been abandoned. But in its place has come pylorectomy or at least a severance of the duodenum from the pylorus. To this certain surgeons object, on the ground that it makes the operation a more severe one; that it makes a permanent obstruction no longer needed when the ulcer heals; that it favors high pressures in the ulcer-bearing region, and possibly that by preventing the contact of hydrochloric acid with the duodenal mucous membrane, it prevents the formation of secretin, and hence results in a diminished secretion of pancreatic juice and bile. We do not think this last a factor, for three reasons, namely: (1) The absence of hydrochloric acid in cases of gastric achylia is not accompanied by a decrease in the secretion of bile and pancreatic juice; (2) hydrochloric acid can produce secretin in the jejunal mucous membrane, as shown by Bayliss and Starling; (3) in these cases there is obviously no lack of bile and pancreatic juice.

In several of our own cases, after a simple gastro-enterostomy had failed to relieve, a secondary operation was done to block the pylorus. We can recall two in which the ulcer had been well up on the lesser curvature and had been excised by the saddle incision, but pylorospasm persisted. They did well after the pyloric excision. We can recall three others in which the ulcer was at or near the pylorus, and the pylorus at operation seemed well stenosed, but the symptoms continued after the gastro-enterostomy. All did well after pyloric obliteration.

Normal Results of Gastro-enterostomy. A gastro-enterostomy regularly results in certain changes, namely: (1) The passage of the acid and sometimes highly acid gastric contents into a jejunum which is habituated only to material that is alkaline; (2) admixture of the gastric contents with the bile and pancreatic juice at an abnormally low point in the intestine; (3) the passage of some poorly disintegrated food into a jejunum accustomed to receiving material that is well chymified. After a mixed meal Smithies found with the stomach tube that the gastric contents showed poor chymification in only 10 per cent. of the cases; yet it would seem that, owing to the position of the stoma, some of the food must be forced through without chymification.

Untoward Sequelæ of Gastro-enterostomy. The most common untoward sequelæ are: Renewed ulcer symptoms, retention symptoms, nausea and fulness without retention, pain, and diarrhea.

Renewed Ulcer Symptoms after Gastro-enterostomy may result from: (1) Failure of the original ulcer to heal. After a remission of a few weeks or months brought about by the rest and diet following operation and similar to remissions after medical treatment the symptoms recur.

2. The development of a new gastric or duodenal ulcer.

3. The development of a true peptic ulcer in the jejunum below the stoma region.

4. The development of ulceration in or about the gastro-intestinal anastomosis. This is probably due in most instances either to trauma from the use of clamps as demonstrated by Troell, Coffey, White and Hamilton or to the employment of unabsorbable sutures. Pool, W. J. Mayo, Mann, Gonnerud, Woolsey and others have reported finding the linen or silk sutures projecting from the bases

of such ulcers. It may be due to careless feeding in the early post-operative period, for in a study of gastro-enterostomy in animals, Flint found the new-formed anastomosis to be the site of a healing ulcerated surface for about two weeks.

Retention symptoms may result from failure of the stoma or obstruction of the jejunum, because:

1. The opening is too far to the left.

2. The opening shrinks unduly. Finney had a case in which in spite of absolute pyloric stenosis the stoma had been reduced to the size of a straw. Von Eiselberg believes that reduction in size of the opening is almost always due to ulceration.

3. The opening is closed by distention of the stomach, which causes stretching of the jejunum over the stoma. Cannon and Blake noted in cats that when the stomach was distended by a large meal the food passed through the stoma with difficulty, so they excised a gastro-enterostomy stomach, tied its pylorus and filled it with water. As the gastric wall became stretched almost no water escaped through the stoma, the comparatively small jejunal wall having flattened out over the opening to become practically a part of the stomach wall.

4. The opening is closed by contraction against it of the cut circular fibers of the jejunum. In the words of Cannon and Blake: "The contraction of the cut circular muscles can have no other effect than to shorten and flatten the intestinal wall between the two lines of attachment." In two of our cases opened under local anesthesia vigorous peristaltic waves were present, and after the anastomosis had been made we observed that as each wave reached the cut in the jejunum the whole wall of the gut flattened against the opening, the effect of the contraction of the circular fibers that had been cut being just that described by Cannon and Blake. It was obvious that anything in the duodenum would shoot up into the stomach rather than pass into the distal limb of the jejunum.

5. The stoma or the jejunum is closed by volvulus or traction, as when the stomach recovers from its operation atony or when the patient reassumes the upright position.

6. The food fails to pass readily into the distal limb of the jejunum because of adhesions with kinking. The circular muscles proximal to this point being cut and stomach peristalsis being absent for many days following operation (Wilensky and Crohn), there is no driving peristaltic force to push the food along, break newly forming adhesions and straighten out a kink (Cannon). We have had two marked cases of obstruction by adhesions with pocketing of the jejunum at a distance of two or three inches beyond the stoma, the roentgen-ray showing immediate passage of food from the stomach, but partial obstruction at the lower point with pouching above.

7. The establishment of a vicious circle, the food that passes through the still open pylorus travelling back into the stomach

through the stoma. Cannon and Blake watched such a process for half an hour, during which time not an atom of food passed into the distal limb of the jejunum. They noted no untoward results from the vicious circle. Vicious circle is usually due to a plastering of the jejunal wall against the opening or to obstruction of the distal limb of the jejunum. Probably it is a cause of untoward symptoms less frequently than usually supposed.

Nausea and Fulness without Retention may result from: (1) Too rapid emptying of the stomach. In feeding with the duodenal tube it has been found that passage of the food too rapidly or at a temperature much above or below that of the body is prone to result in feelings of distention, nausea, weakness or even collapse, symptoms quite the same as in occasional cases after gastro-enterostomy. (2) Possibly though not certainly from too abundant regurgitation of bile. In practically all cases after gastro-enterostomy bile is regurgitated into the stomach yet no nausea ensues. But in two striking cases during the periods of nausea we have noted excessive quantities of bile in the stomach contents, while in the same patients when free from nausea there was very little bile. We have been inclined to attribute the nausea to the abundant bile in the stomach though it is possible that the responsible factor may have been something else, the extra bile having regurgitated as the result of gagging. For though bile when swallowed is nauseating, yet fresh ox-bile has been administered by stomach tube by John Gerster without nausea.

Pain is usually the result of ulcer or adhesions, especially adhesions to the anterior abdominal wall.

Diarrhea is probably a sequel either to a too rapid emptying of the stomach, to irritation of the jejunum by either the acid stomach contents or coarse food particles, to changes in the pancreatic secretion, or to a superabundance of fat in the food (Cameron).

From Matthieu's Clinic at the St. Antoine, Paris, it was reported that very few if any of their cases of gastro-enterostomy, if followed over a sufficiently long time, failed to show some pathologic symptoms, gastric or intestinal.

In a study of cases following posterior gastrojejunostomy with exclusion or removal of the pylorus, Wilensky and Crohn found that 11 did well after the operation, though it was necessary to curtail the amount of food permitted, 14 showed definite disturbances in physiology and 7 showed mechanical disturbances in the functions of the gastrojejunal stoma. In almost all there was absence of peristalsis one month after operation.

In the group that apparently did well motility and acidity were slightly diminished and there was a distinct and persistent hypersecretion.

In the group with physiologic disturbances there were mental depression with poor nutrition, pain, vomiting, occasionally hematemesis, and constipation or rarely diarrhea. There were definite delay in motility, hypersecretion with a high acidity curve to the end of digestion and a poorly functioning stoma, produced not by stomal closure but by disturbed muscular function.

In the group with mechanical or organic changes at the stoma there were markedly delayed motility with retention, a high acidity curve, violent peristalsis, six-hour roentgen ray residue and insufficient or closed stoma.

Summary. Considering all the possibilities we have mentioned and other postoperative complications, such as hernia, rectus diastasis, gastro-intestinal fistula and various unmentioned abdominal adhesions, and in addition the operative mortality and the number of cases that after a period of relief show relapse similar to that following medical relief, we must feel that surgery in an ulcer case must not be too lightly resorted to. As Wilensky and Crohn say, "It is evident that the impression that gastrojejunostomy is an operation which in no way impairs the functional efficiency of the stomach is an erroneous one. In only a minority of the cases does the stomach return to an almost normal state of functional activity."

We do not wish, however, to disparage the use of the operation in the proper case, and would say with Crohn that we could not treat disorders of the stomach without using gastro-enterostomy. But its value is to make an exit for food when the normal exit is not available. And we hold with Torek that "the treatment of ulcer of the stomach is essentially medical and not surgical, and that it is only certain of its complications or sequelæ that require surgical intervention." We now leave the subject of gastro-enterostomy.

Cases of Ulcer which Require Operation. The emergency cases we have already considered. Of the others we have those in which surgery is imperative from the outset and those in which surgery should be resorted to only after thorough medical treatment.

Surgery Imperative. We consider surgery imperative and medical treatment futile in the following conditions, namely: (1) Chronic penetration as shown by radiographs; (2) palpable induration; (3) adhesions which cause distortion of the stomach, interference with peristalsis or much pain during the digestive period; (4) permanent hour-glass; (5) pyloric stenosis not syphilitic; (6) repeated copious hemorrhages; (7) conditions which suggest that an ulcer is becoming carcinomatous. In duodenal ulcer, as carcinomatous change rarely occurs, this is not of moment; but since in gastric ulcer this change is not infrequent, its possibility must induce an earlier consideration of surgery.

Surgery only after Expert Medical Treatment. The majority of peptic ulcer cases can, in our opinion, be definitely said to require surgery only after the failure of thorough and prolonged medical treatment. When a case is medical the relief of symptoms (not the cure) by treatment is, as a rule, quite prompt. Therefore, on the one hand, the failure of the treatment to relieve the symptoms suggests that the case is probably surgical; whereas, on the other hand, when a case seems in all likelihood surgical, but not certainly so, a course of medical treatment is advisable to prove the point. Furthermore, if the patient shows a positive Wassermann reaction or gives a history or any physical evidence of syphilis, antileutic treatment should be tried.

Given a thorough medical trial by someone competent to supervise the treatment, we should consider those cases surgical which continue to show: (1) Persistent or recurrent hemorrhage even small in amount; (2) pain; (3) nausea; (4) pylorospasm of such persistence as to simulate pyloric stenosis; (5) inability to ingest comfortably the ordinary wholesome foods permitted by the circumstances of the patient, this making the poor patient a surgical case earlier than the well-to-do one; (6) inability to ingest comfortably enough food to maintain nutrition while living a normally occupied life; (7) recurrence after apparently a cure. Or, as C. H. Mayo expresses it: "The best type of gastric case for surgery is that in which every method of medical treatment has failed or the patients have become tired of the rigid diet and care which are necessary to relieve or to prevent relapse." This is our answer to the question when to operate in peptic ulcer cases. We shall not attempt to answer the question when to perform a second or a third operation if symptoms persist.

When an ulcer case is referred to the surgeon the physician must still feel his responsibility to the patient, and in order to provide against having a surgical failure follow the medical failure should urge the serious attention of the surgeon to the following statements, namely: that of Ginsburg, that "small quantities of food at frequent intervals have a better physiologic effect upon the recently short-circuited stomach than three daily meals;" that of Cannon, that "after gastro-enterostomy, effective action of the anastomosis demands that there shall not be more than a moderate distention of the stomach;" and that of Troell, that "the recurrence of symptoms following operation in many cases depends to a considerable degree on the surgeon's neglecting to give dietetic and other prescriptions suitable for ulcer." We would commend the counsel of W. J. Mayo that "following surgical intervention the patient should be under good medical advice until permanent cure is assured;" and that of Carter that "after operation every opportunity for healing and cicatrization should be given, involving, as this does, weeks or months, during all of which time the diet should be bland, soft and free from thermal, mechanical or chemical irritants." No longer should we tolerate a surgeon who places an ulcer case on heavy and bulky diet within two or three weeks of his operation.

REFERENCES.

1. Alvarez, W. C.: Tr. Am. Gastro-ent. Assn., 1919, 86.
2. Bayliss and Starling: Jour. Physiol., 1902, xxviii, 325.
3. Cameron: British Med. Jour., 1908, i, 144.
4. Cannon, W. B.: Mechanical Factors of Digestion, London, 1911.
5. Cannon and Blake: Ann. Surg., 1905, xli, 686.
6. Carman and Balfour: Jour. Am. Med. Assn., 1915, lxv, 227.
7. Carroll, A. H.: Ann. Surg., 1915, lxi, 517.
8. Carter, H. S.: Am. Jour. Med. Sc., 1917, cliv, 851.
9. Connell, F. G.: Surg., Gynec. and Obst., December, 1914, 20.
10. Crohn and Wilensky: Arch. Int. Med., 1917, xx, 145.
11. Deaver, J. B.: Ann. Surg., 1917, lxv, 246.
12. Delbet: Bull. et mém. soc. de Chir., Paris, 1907, xxxiii, 1250.
13. Finney, J. M. T.: Ann. Surg., 1914, lx, 131.
14. Finney and Friedenwald: Am. Jour. Med. Sc., 1915, l, 469.
15. Flint, J. M.: Ann. Surg., 1917, lxv, 202.
16. Gerster, J. C. A.
17. Ginsburg, N.: Ann. Surg., 1916, lxiii, 733.
18. Gonnerud, Paul: Ann. Surg., 1917, lxvi, 177.
19. Grey, E. G.: Jour. Exp. Med., 1917, xxvi, 825.
20. Guibe: Jour. de Chirur., 1908, i, 1.
21. Haertel: Deutsch. Ztschr. f. Chirurg., 1911, cxix, 317.
22. Hartmann, H.: Tr. Am. Surg. Assn., 1914, xxxii, 381.
23. Kelling: Arch. f. klin. Chirurg., 1900, lxx, 259; Deutsch. Ztschr. f. Chirurg., 1901, lx, 157.
24. Lewisohn, R.: Ann. Surg., 1918, lxvii, 560.
25. Lindberg: Nordische Med. Arch., 1915.
26. Mann, F. C.: Jour. Med. Research, 1917, xxxv, 294.
27. Martin, Frank: Ann. Surg., 1915, lxi, 517.
28. Matthieu: Mentioned by T. R. Brown, Tr. Am. Gastro-ent. Assn., 1916, 216.
29. Mayo, C. H.: Minnesota Med., 1919, ii, 1.
30. Mayo, W. J.: Jour. Am. Med. Assn., 1915, lxiv, 2036.
31. Mills, R. W.: Tr. Am. Gastro-ent. Assn., 1919, 56.
32. Moritz: Ztschr. f. Biol., 1895, xxxii, 359.
33. Moynihan, Sir Berkeley: British Med. Jour., 1908, i, 1092.
34. Outland, Skinner and Clendenning: Surg., Gynec. and Obst., 1913, xvii, 175.
35. Paterson, H. J.: Ann. Surg., 1909, l, 367; Tr. Internat. Cong. Med., London, 1913.
36. Peck, C. H.: Ann. Surg., 1915, lxi, 407.
37. Petren: Beiträg. z. klin. Chirurg., 1914, lxxvi, 305.
38. Pool, E. H.: Ann. Surg., 1917, lxvi, 122.
39. Schueller: Grenzgeb. d. Med. und Chirurg., 1911, 22.
40. Scudder: New York Med. Jour., 1914, xiv, 367. Surg., Gynec. and Obst., 1914, xviii, 145.
41. Sick, W.: Deutsch. Arch. f. klin. Med., 1906–07, lxxxviii, 190.
42. Smithies, Frank: Surg., Gynec. and Obst., March, 1918, xxvi, 275. Tr. Am. Gastro-Ent. Assn., 1917, 62.
43. Torek, Franz: Am. Jour. Surg., February, 1908, 22.
44. Troell, A.: Ann. Surg., 1917, lxvi, 664.
45. Truesdale, P. E.: Tr. Am. Gastro-ent. Assn., 1916, 214.
46. Tuffier: La Semaine Méd., 1907, ii, 511.
47. Von Eiselberg: Med. Press and Circular, 1914, cviii, 196.
48. Von Pfungen: Centralbl. f. Physiol., 1887, i, 220.
49. Wilensky, A. O.: Ann. Surg., 1917, lxv, 730.
50. Wilensky and Crohn: Am. Jour. Med. Sc., 1917, cliii, 808.
51. Woolsey, George: Ann. Surg., 1917, lxvi, 122.